Remarks/Arguments

Claims 1 and 3-12 are pending in the application with claim 1, 3, 4 and 7 being amended and claim 12 being added by this response. Support for the amendments can be found in Fig. 2 and Fig. 5 and as well as on page 9, lines 5-35 of the specification. Support for new claim 12 is found on FIG. 7 as well as on page 9, lines 6-13. Thus, no new matter is introduced.

Rejection of claims 1-11 under 35 U.S.C. 103(a)

Claims 1-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ye et al. (US 2006/00080000, hereinafter referred to as "Ye") in view of Hallapuro et al., (US 7,349,473, hereinafter referred to as "Hallapuro").

The failure of an asserted combination to teach or suggest each and every feature of a claim remains fatal to an obviousness rejection under 35 U.S.C. § 103. Section 2143.03 of the MPEP requires the "consideration" of every claim feature in an obviousness determination. To render a claim unpatentable, however, the Office must do more than merely "consider" each and every feature for this claim. Instead, the asserted combination of the patents must also teach or suggest *each and every claim feature*. *See In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974) (emphasis added) (to establish *prima facie* obviousness of a claimed invention, all the claim features must be taught or suggested by the prior art). Indeed, as the Board of Patent Appeals and Interferences has confirmed, a proper obviousness determination requires that an Examiner make "a searching comparison of the claimed invention - *including all its limitations* - with the teaching of the prior art." *See In re Wada and Murphy*, Appeal 2007-3733, *citing In re Ochiai*, 71 F.3d 1565, 1572 (Fed. Cir. 1995) (emphasis in original). "If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious" (MPEP §2143.03, citing *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)).

Claim 2 was cancelled by a prior response and thus the rejection of claim 2 is moot and should be withdrawn.

The present arrangement as claimed in claim 1 provides a method and apparatus of decoding a picture sequence coded with spatial and temporal scalability. The coded data includes motion information. A spatial synthesis step is followed by a hierarchical temporal synthesis step carrying out a motion compensated temporal filtering, or MCTF, of pictures at a frequency decomposition level. The hierarchical temporal synthesis step includes a motion estimation step using spatial interpolation filters. During a motion compensated temporal filtering operation, the resolution chosen for the use of the motion information and the number of coefficients of the spatial interpolation filters used for motion estimation are controlled by a motion configuration choice circuit and depend on a decoding scenario. The decoding scenario depends at least on a spatial resolution selected for the decoding and a bit-rate selected for the decoding. The present claimed arrangement is patentable as neither Ye nor Hallapuro teach each feature of the claimed arrangement.

Ye does not teach or suggest "a spatial synthesis step that is followed by a hierarchical temporal synthesis step carrying out a motion compensated temporal filtering, or MCTF, of pictures at a frequency decomposition level" as recited in the present claimed arrangement. Also Ye does not teach or suggest, "the decoding scenario depends at least on a spatial resolution selected for the decoding and a bit-rate selected for the decoding" as recited in the present claimed arrangement.

Ye describes two general concepts in wavelet-based video coding schemes, namely overcomplete (OW) wavelet and interframe wavelet (see e.g. para. [0005-0006]). In overcomplete wavelet coding schemes the spatial wavelet transform for each frame is performed *first*, followed by the exploitation of interframe (i.e. temporal) redundancy by predicting wavelet coefficient values. In interframe wavelet coding schemes (also called spatial domain MCTF or SDMCTF) the spatial wavelet transform is performed *after* an exploitation of temporal redundancy (this is the meaning of "wavelet filtering along the

temporal axis" in para.[0005]). In other words, the sequential order of spatial and temporal processing is exchanged in the OW scheme, compared to the SDMCTF scheme. Therefore, both schemes are mutually exclusive.

However, Ye does not teach or suggest "a spatial synthesis step that is followed by a hierarchical temporal synthesis step carrying out a motion compensated temporal filtering, or MCTF, of pictures at a frequency decomposition level" as in the present claimed arrangement. Ye describes an improvement for OW schemes in para.[0033] "The interleaving process, performed by the leaving unit 220, combines the different phase information provided by the overcomplete wavelet coefficients to generate an extended reference frame. Accordingly, there is no need to decode the phase information separately as in previous IBMCTF based video coding methods." (Further see, e.g., para. 0002, 0010-0013, 0032-0035). Therefore describing methods using an OW based video coding scheme.

Additionally, Ye teaches in para.[0027] that, "The IBMCTF method of the present invention overcomes the drawbacks of previous coding methods, and demonstrates coding efficiency comparable or better than conventional interframe wavelet coding methods that utilize spatial domain motion compensated temporal filtering." Therefore, Ye teaches away from the conventional interframe wavelet coding methods that utilize spatial domain motion compensated temporal filtering.

In contrast, the present claimed arrangement performs an interframe wavelet decoding scheme. As shown in Fig.5, the present claimed arrangement provides a decoding scheme that performs spatial synthesis first and then the temporal synthesis based on the temporal decompositions. Thus, unlike the present claimed arrangement, Ye neither discloses nor suggests "a spatial synthesis step that is followed by a hierarchical temporal synthesis step carrying out a motion compensated temporal filtering, or MCTF, of pictures at a frequency decomposition level of motion information" as presented in claimed arrangement.

Additionally, independent claim 1 has further been amended for purposes of clarification to recite that not only the bit-rate but also the spatial resolution on which the decoding scenario depends, is selected for the decoding. Ye does not teach or suggest, "the decoding scenario depends at least on a spatial resolution selected for the decoding and a bit-rate selected fort he decoding" as recited in the present claimed arrangement. Ye discloses in para.[0040] that "If there are many decoders with different computation power and displays, the same scalable bitstream can be used to support all those decoders through SNR/spatial/temporal scalability." In Ye the decoder is selected according to the spatial decomposition of the video signal. This is unlike the present arrangement as claimed in claim 1, in which the spatial and bit-rate information define a decoding scenario. The spatial resolution is thus being selected for the decoding.

Furthermore, it is conceded in the Office Action that Ye neither teaches nor suggests that a number of coefficients of the interpolation filter used for the motion compensation depends on the decoding scenario. The Office Action cites Hallapuro to show this feature. Applicant respectfully disagrees.

Hallapuro describes a method of reducing interpolation complexity during coding/decoding of video sequences by using different prediction types on the pre-divided blocks. The blocks are divided according to image size and then a motion compensated prediction for the block is formed using a selected prediction type and interpolation filter for the particular block (image data of the block). This reduces the complexity of the interpolation filter by using shorter filters when multi-picture prediction is used.

However, Hallapuro, similar to Ye, does not teach or disclose "a spatial synthesis step that is followed by a hierarchical temporal synthesis step carrying out a motion compensated temporal filtering, or MCTF, of pictures at a frequency decomposition level" as in the present claimed arrangement. Hallapuro does not use spatial resolution or temporal filtering in order to accomplish multi picture prediction, instead it uses bi-directionally predicted blocks (See col. 7, lines 9-18).

Also Hallapuro, similar to Ye, does not teach or suggest "the decoding scenario depends at least on a spatial resolution selected for the decoding and a bit-rate selected fort he decoding" as in the present claimed arrangement. Hallapuro describes motion compensation prediction based upon blocking and not spatial resolution.

Additionally, Hallapuro, similar to Ye, does not teach or suggest, "the resolution chosen for the use of the motion information and the number of coefficients of the spatial interpolation filters used for the motion estimation are controlled by a motion configuration choice circuit and depend on a decoding scenario" as recited in the present claim arrangement.

Unlike the present claimed arrangement, Hallapuro describes in col. 12, lines 11-20 that "the interpolation filter may be changed based on the characteristics of the block, the size and/or the shape of the block". This is unlike the present claimed arrangement, which decodes and selects the interpolation filter according to the spatial and temporal resolutions. Spatial resolution depends on the number of pixels, while it is generally independent from block size. A block size and block shape refer only to processing units of an image, not to the image as such.

Furthermore, a combination of Ye and Hallapuro, similar to the individual systems as discussed above, will not produce the present arrangement as claimed in claim 1. A combination of Ye and Hallapuro, similar to the individual systems, do not teach or suggest the "decoding scenario depends at least on a spatial resolution selected for the decoding and a bit-rate selected for the decoding" as in the present claim arrangement. The combination of Ye and Hallapuro, similar to the individual systems, also neither teach nor suggest "a spatial synthesis step that is followed by a hierarchical temporal synthesis step carrying out a motion compensated temporal filtering, or MCTF, of pictures at a frequency decomposition level" as in the present claimed arrangement. The combination of Ye and Hallapuro neither teach nor suggest "the decoding scenario depends at least on a

spatial resolution selected for the decoding and a bit-rate selected fort he decoding" as in the present claimed arrangement. As the combination similar to the individual systems neither teach nor suggest each feature of the present arrangement as claimed in claim 1, it is respectfully submitted that the present claimed arrangement is patentable over the combination of Ye and Hallapuro.

In view of the above remarks, it is respectfully submitted that the Office Action fails to make a prima facie case that the present claimed arrangement as claimed in claim 1 is obvious over Ye and Hallapuro, when taken alone or in combination. Consequently, it is respectfully submitted that the rejection of claim 1 is overcome and should be withdrawn. Claim 3 is dependent on claim 1 and thus is patentable for the same reasons as claim 1.

Claim 7 is a decoder apparatus including features similar to those of claim 1 discussed above. Thus, it is respectfully submitted that claim 7 is patentable for the same reasons as claim 1 discussed above. Claims 10 and 11 depend from and inherit all the features of claim 7. Therefore, claims 10 and 11 are patentable for at least the reason that they respectively depend from claim 7, with each dependent claim containing further distinguishing features.

In light of above, Ye and Hallapuro, alone or in combination, do not show all the limitations of the claims above. The Examiner did not make a prima facie case of obviousness and therefore Applicants request the withdrawal of the rejection of claims 1, 3, 7 and 10-11 under 18 U.S.C. §103.

The present arrangement as claimed in Claim 4 provides a method and apparatus for coding a picture sequence of a given spatial resolution, with spatial and temporal scalability. A hierarchical temporal analysis step and a subsequent spatial analysis step, the hierarchical temporal analysis step carries out a motion compensated temporal filtering, or MCTF, of pictures at a frequency decomposition level, from motion information obtained by a motion estimation step performed between these pictures, to provide pictures

at a higher decomposition level. During a motion compensated temporal filtering operation, the resolution chosen for the use of the motion information and the number of coefficients of the interpolation filters used depends at least upon the given spatial resolution of the source pictures. The motion estimation step includes a first motion configuration choice for determining operating conditions of the motion estimation according to different decomposition levels of pictures received from the hierarchical temporal analysis step. The hierarchical temporal analysis step includes performing a motion compensation and a second motion configuration choice for determining a configuration of the motion compensation according to the decomposition levels of the pictures or the given spatial resolution. The present claimed arrangement is patentable as neither Ye nor Hallapuro teach each feature of the claimed arrangement.

Ye neither teaches nor suggests "a hierarchical temporal analysis step and a subsequent spatial analysis step, the hierarchical temporal analysis step carries out a motion compensated temporal filtering, or MCTF, of pictures at a frequency decomposition level" as recited in the present claimed arrangement.

Ye describes two general concepts in wavelet-based video coding schemes, namely overcomplete (OW) wavelet and interframe wavelet (see e.g. para. [0005-0006]). In overcomplete wavelet coding schemes the spatial wavelet transform for each frame is performed *first*, followed by the exploitation of interframe (i.e. temporal) redundancy by predicting wavelet coefficient values. In interframe wavelet coding schemes (also called spatial domain MCTF or SDMCTF) the spatial wavelet transform is performed *after* an exploitation of temporal redundancy (this is the meaning of "wavelet filtering along the temporal axis" in para.[0005]). In other words, the sequential order of spatial and temporal processing is exchanged in the OW scheme, compared to the SDMCTF scheme. Therefore, both schemes are mutually exclusive.

However, Ye does not teach or suggest "a hierarchical temporal analysis step and a subsequent spatial analysis step, the hierarchical temporal analysis step carries out a

motion compensated temporal filtering, or MCTF, of pictures at a frequency decomposition level" as in the present claimed arrangement. Ye describes an improvement for OW schemes in para.[0033] "The interleaving process, performed by the leaving unit 220, combines the different phase information provided by the overcomplete wavelet coefficients to generate an extended reference frame. Therefore describing methods using an OW based video coding scheme.

Additionally, Ye teaches in para.[0027] that, "The IBMCTF method of the present invention overcomes the drawbacks of previous coding methods, and demonstrates coding efficiency comparable or better than conventional interframe wavelet coding methods that utilize spatial domain motion compensated temporal filtering." Therefore, Ye teaches away from the conventional interframe wavelet coding methods that utilize spatial domain motion compensated temporal filtering.

In contrast, the present claimed arrangement performs an interframe wavelet coding scheme. As shown in Fig.2, the present claimed arrangement provides a coding scheme that performs temporal analysis first, before the spatial analysis. The temporal analysis circuit (Ref. No. 4 in fig.2) carries out a motion compensated temporal analysis, and provides frequency subbands to a spatial analysis circuit (ref.sign 5) that separately performs subband coding. Unlike the present claimed arrangement, Ye neither discloses nor suggests "a hierarchical temporal analysis step and a subsequent spatial analysis step, the hierarchical temporal analysis step carries out a motion compensated temporal filtering, or MCTF, of pictures at a frequency decomposition level, from motion information obtained by a motion estimation step performed between these pictures, to provide pictures at a higher decomposition level" as in the present claimed arrangement.

Furthermore, it is conceded in the Office Action that Ye neither teaches or suggests number of coefficients of the interpolation filter used for the motion compensation depends on the spatial resolution of the source pictures. The Office Action cites Hallapuro to show this feature. Applicant respectfully disagrees.

Hallapuro describes a method for reducing interpolation complexity during coding/decoding of video sequences by using different prediction types on the pre-divided blocks. The blocks are divided according to image size and then a motion compensated prediction for the block is formed using a selected prediction type and interpolation filter for the particular block (image data of the block). This reduces the complexity of the interpolation filter by using shorter filters when multi-picture prediction is used.

However, Hallapuro, similar to Ye, does not teach or disclose "a spatial synthesis step that is followed by a hierarchical temporal synthesis step carrying out a motion compensated temporal filtering, or MCTF, of pictures at a frequency decomposition level" as in the present claimed arrangement. Hallapuro does not use spatial resolution or temporal filtering in order to accomplish multi picture prediction, instead it uses bi-directionally predicted blocks (See col. 7, lines 9-18).

Additionally, Hallapuro, similar to Ye, does not teach or suggest, "the resolution chosen for the use of the motion information and the number of coefficients of the spatial interpolation filters used depends at least upon the given spatial resolution of the source pictures" as recited in the present claim arrangement.

Unlike the present claimed arrangement, Hallapuro describes in col. 12, lines 11-20 that "the interpolation filter may be changed based on the characteristics of the block, the size and/or the shape of the block". This is unlike the present claimed arrangement, which codes and selects the interpolation filter according to the spatial and temporal resolutions. Spatial resolution depends on the number of pixels, while it is generally independent from block size. A block size and block shape refer only to processing units of an image, not to the image as such. . Hallapuro or Ye, alone or in combination, do not teach or suggest the "decoding scenario depends at least on a spatial resolution selected for the decoding and a bit-rate selected for the decoding" as taught by the present claim arrangement.

Furthermore, a combination of Ye and Hallapuro, similar to the individual systems as discussed above, will not produce the present arrangement as claimed in claim 4. The

combination of Ye and Hallapuro, similar to the individual systems, neither teach nor suggest "a spatial synthesis step that is followed by a hierarchical temporal synthesis step carrying out a motion compensated temporal filtering, or MCTF, of pictures at a frequency decomposition level" as in the present claimed arrangement. The combination of Ye and Hallapuro also neither teach nor suggest "the resolution chosen for the use of the motion information and the number of coefficients of the spatial interpolation filters used depends at least upon the given spatial resolution of the source pictures" as in the present claimed arrangement. As the combination similar to the individual systems neither teach nor suggest each feature of the present arrangement as claimed in claim 4, it is respectfully submitted that the present claimed arrangement is patentable over the combination of Ye and Hallapuro.

In view of the above remarks, it is respectfully submitted that the Office Action fails to make a prima facie case that the present claimed arrangement as claimed in claim 4 is obvious over Ye and Hallapuro, when taken alone or in combination. Consequently, it is respectfully submitted that the rejection of claim 4 is overcome and should be withdrawn. Claims 5 and 6 are dependent on claim 4 and thus is patentable for the same reasons as claim 4.

Claim 8 and 9 are directed to a coder and include features similar to those of claim 4 discussed above. Thus, it is respectfully submitted that claims 8 and 9 are patentable for the same reasons as claim 4.

In light of above, Ye and Hallapuro, alone or in combination, do not show all the limitations of the claims above. The Examiner did not make a prima facie case of obviousness over the combination of Ye and Hallapuro. Therefore Applicants respectfully request the withdrawal of the rejection of claims 1, 3-11 under 18 U.S.C. §103.

The present response includes new dependent claim 12 further defining the decoding scenario depends also on the temporal decomposition level. The claimed feature

is disclosed e.g. in Fig. 7, which shows in a decoder flow-chart for motion configuration choice the dependency on a temporal decomposition level (reference sign 25). The feature is also not disclosed in the cited prior art, since no dependency on a bit-rate at least for the decoding is mentioned or suggested. New claim 12 is dependent on independent claim 1 and thus it is respectfully submitted that claim 12 is patentable for the same reasons as claim 1 discussed above.

Conclusion

Having fully addressed the Examiner's rejections it is believed that, in view of the preceding amendments and remarks, this application stands in condition for allowance. Accordingly then, reconsideration and allowance are respectfully solicited. If, however, the Examiner is of the opinion that such action cannot be taken, the Examiner is invited to contact the applicants' attorney at the telephone number listed below, so that a mutually convenient date and time for a telephonic interview may be scheduled.

No fee is believed to have been incurred by virtue of this amendment. However if a fee is incurred on the basis of this amendment, please charge such fee against deposit account 07-0832.

Respectfully submitted,
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